

Higgs cross sections as a function of center of mass energy

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January 16 - 2008

Content

1 Introduction

- Motivation
- Tools and Parameters

2 Cross Sections

- Center of mass energies
- 4l Branching Ratio
- VBF, WH and ZH

3 K-Factors

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- Motivation
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Motivation and Introduction

- The LHC running at center of mass energy lower than 14 or even 10 TeV is likely
- To be prepared, Higgs Cross sections calculations at NLO at energies different than 14 or 10 TeV are calculated
- This presentation shows the estimated SM Higgs cross sections for:
 - masses between 100 and 800GeV,
 - center of mass energies between 1 and 15TeV,
 - leading and next to leading order, (and the corresponding K-Factors),
 - production processes:
 - $gg \rightarrow H$
 - $qq \rightarrow qqH$
 - $pp \rightarrow ZH$
 - $pp \rightarrow WH$

Tools

Input Parameters:¹

M_{uds} (MeV)	190	M_c (GeV)	1.4	M_b (GeV)	4.60	M_t (GeV)	172
M_Z (GeV)	91.187	M_W (GeV)	80.41	G_F	$1,16639 \times 10^{-5}$	N_F	5

LO	NLO		
$\Lambda_{QDC}^{\text{LO}}$ (MeV)	165	$\Lambda_{QDC}^{\text{NLO}}$ (MeV)	226
$\alpha_s^{\text{LO}}(M_Z)$	0.130	$\alpha_s^{\text{NLO}}(M_Z)$	0.118

- Gluon gluon fusion → HIGLU
- Vector Boson Fusion → VV2H
- Higgs production in association with W and Z bosons → V22HV

Written in Fortran by Michael Spira (PSI)
<http://people.web.psi.ch/spira/>

¹Higgs Production Cross-Sections and Branching Ratios for the ATLAS Higgs Working Group
 B. Mellado, L. Nisati, D. Rebuzzi, S. Rosati, G. Unal and SL Wu

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1 Introduction

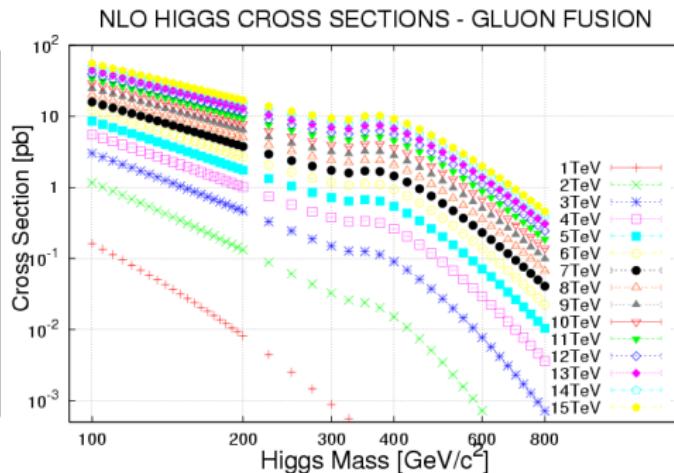
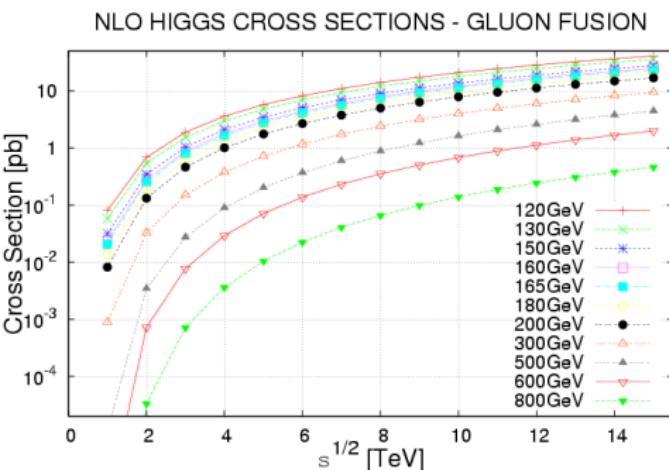
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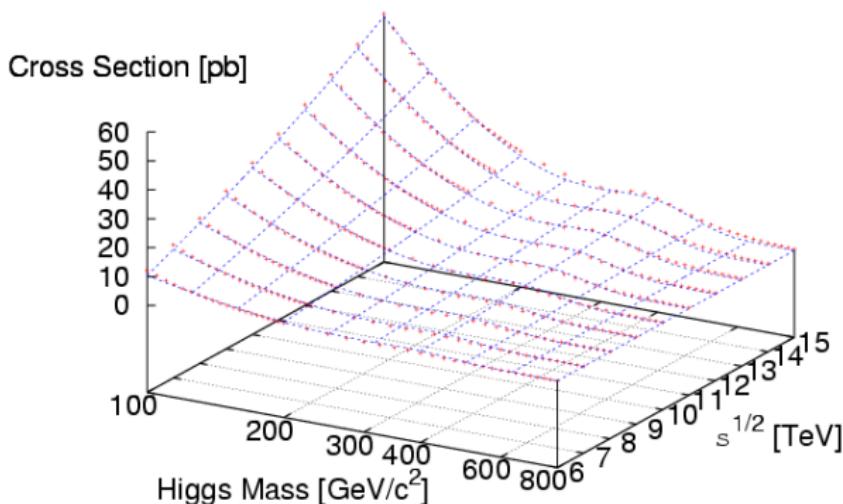
3 K-Factors

Gluon gluon fusion



Gluon gluon fusion

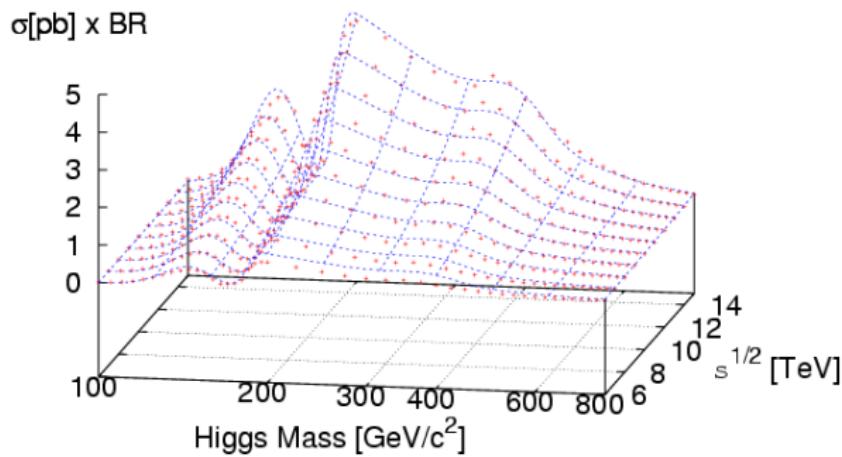
NLO HIGGS CROSS SECTIONS - GLUON FUSION



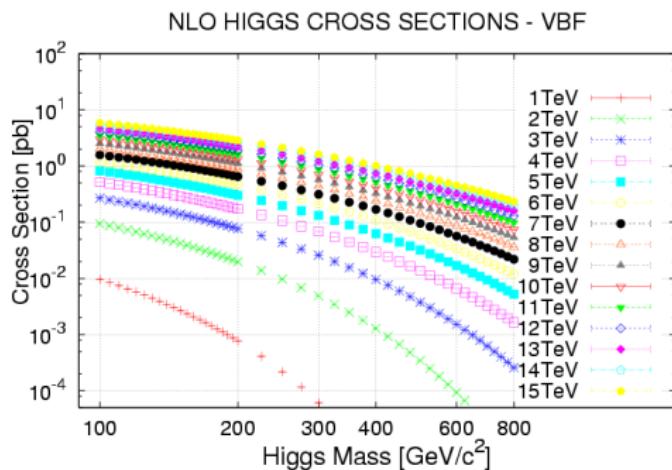
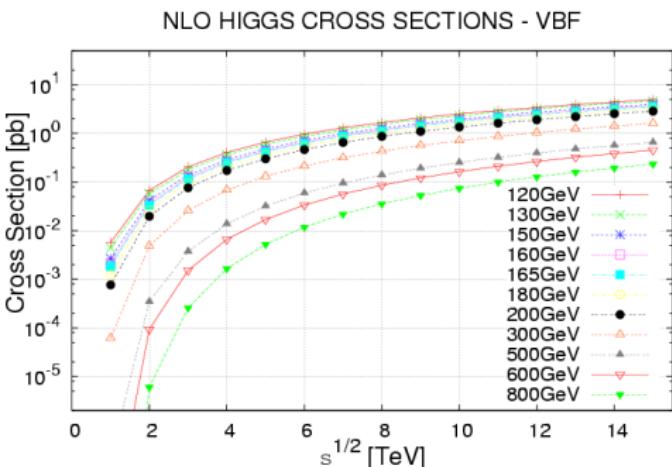
Branching Ratio^a, 4l Channel

^aHiggs Production Cross-Sections and Branching Ratios for the ATLAS Higgs Working Group
B. Mellado, L. Nisati, D. Rebuzzi, S. Rosati, G. Unal and SL Wu

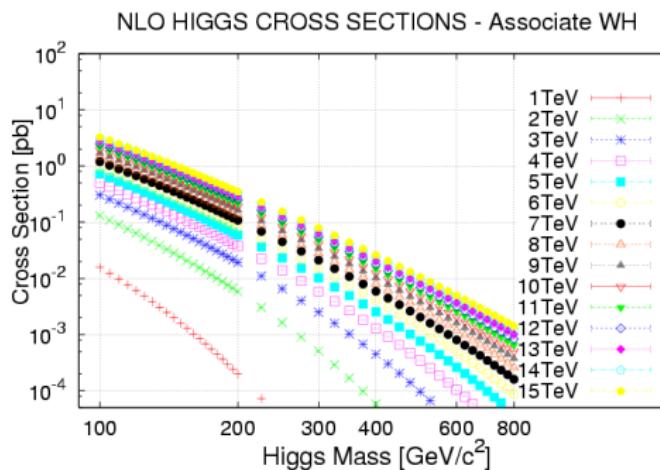
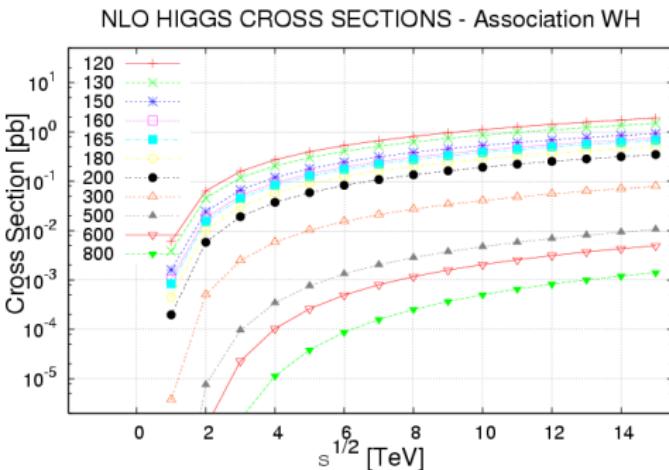
NLO HIGGS CROSS SECTIONS x BR - GLUON FUSION



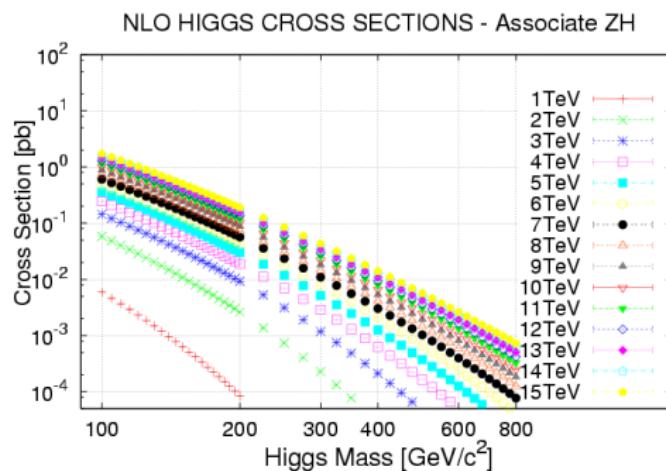
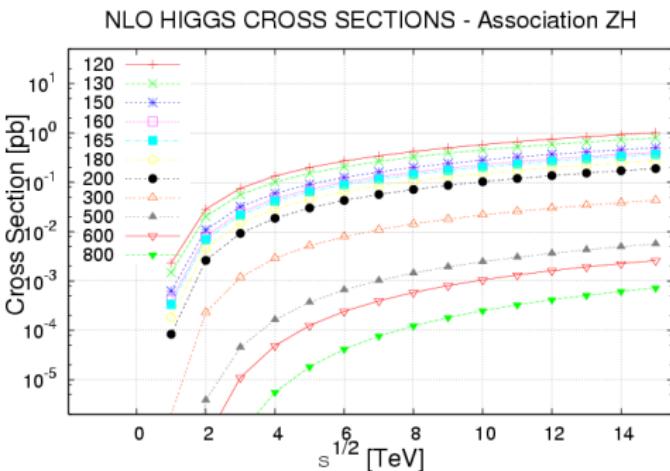
Vector Boson Fusion



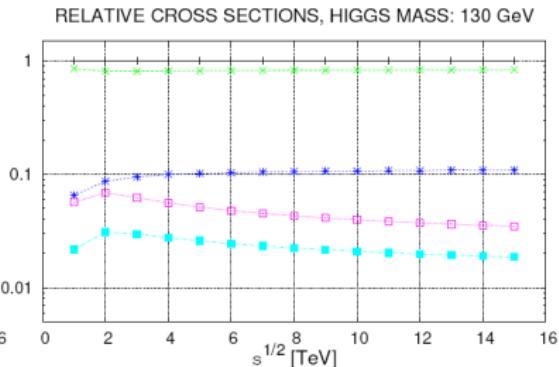
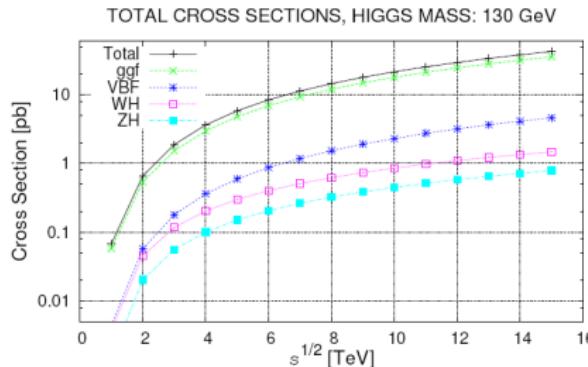
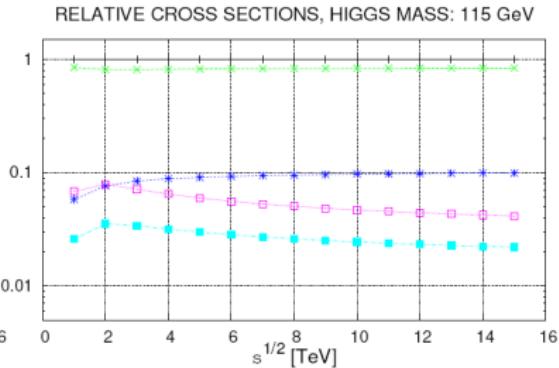
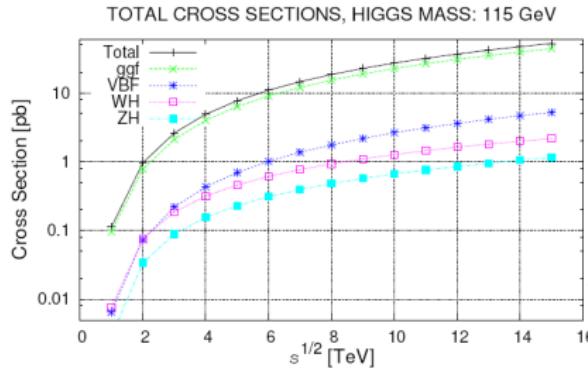
Higgs production in association with W boson



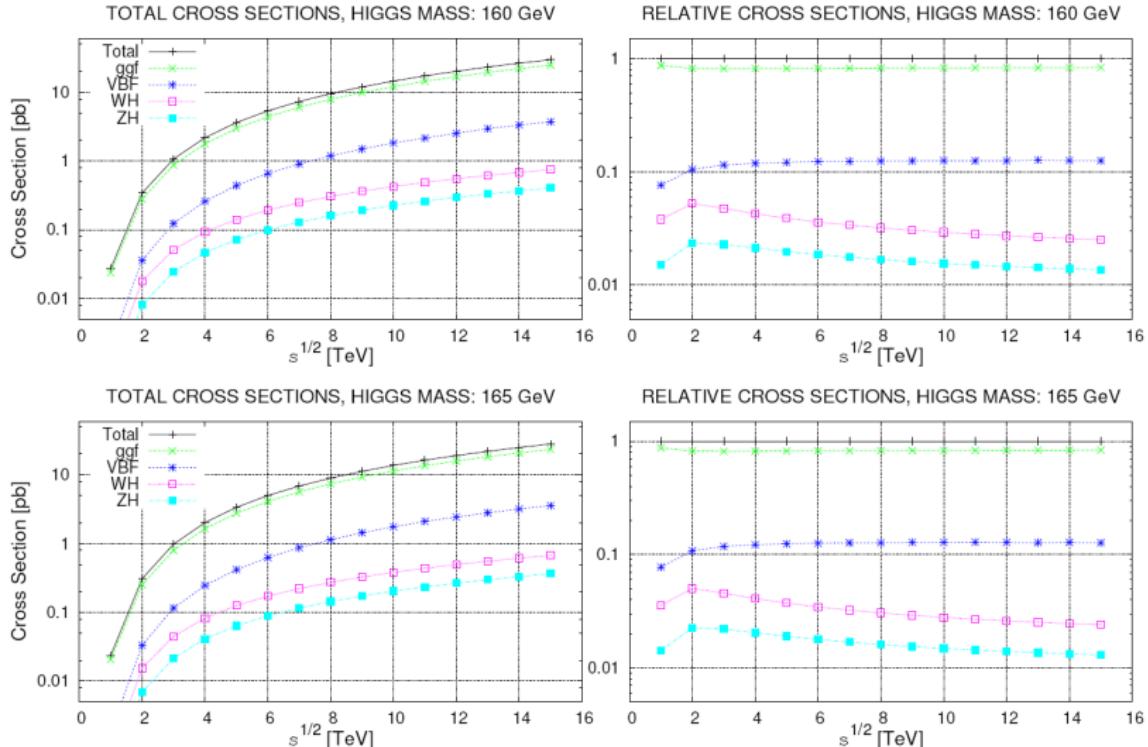
Higgs production in association with Z boson



All Together



All Together



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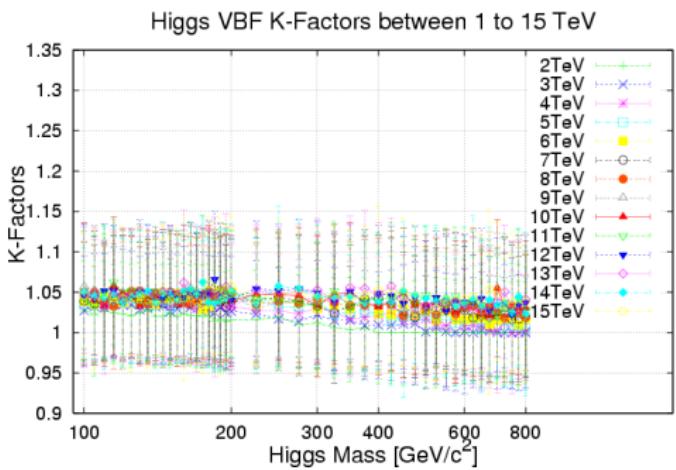
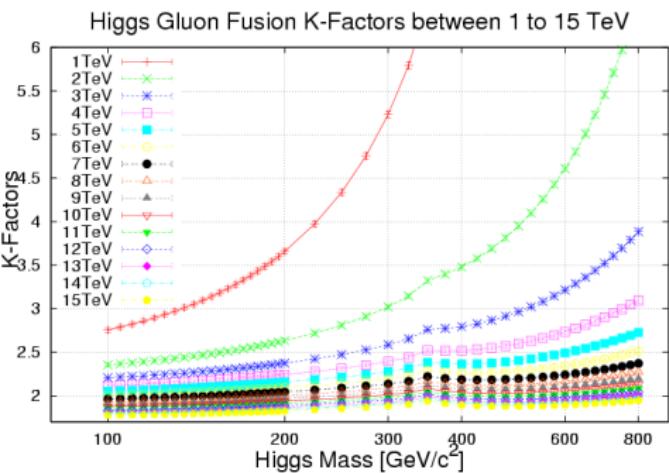
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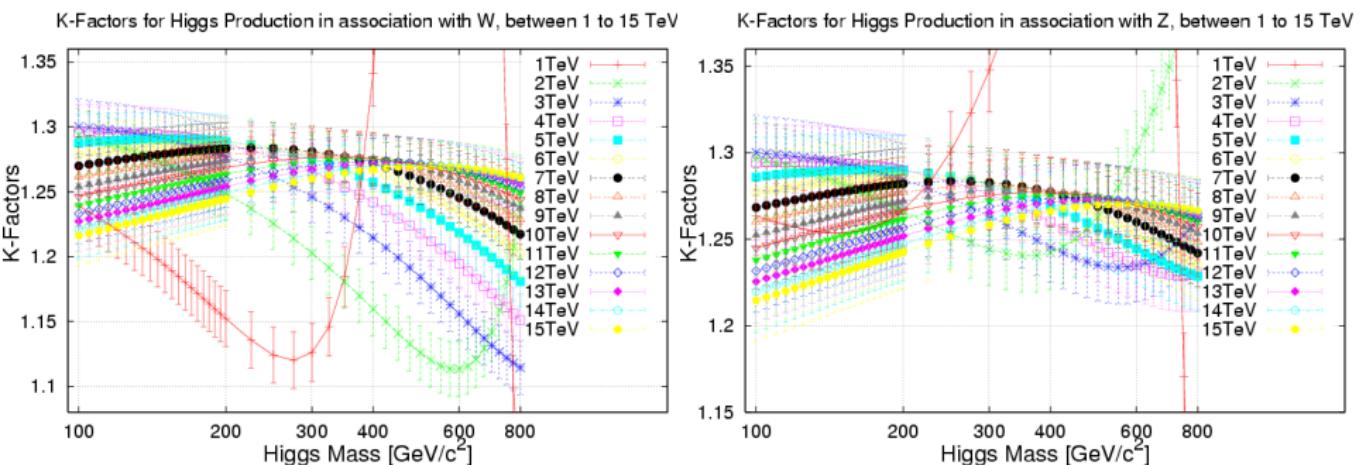
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3 K-Factors

K-Factors



K-Factors



Summary

- Standard Model Higgs cross sections at leading and next to leading order were estimated for:
 $100\text{GeV} \leq m_H \leq 800\text{GeV}$; $1\text{TeV} \leq \text{CME} \leq 15\text{TeV}$
- Comparisons for the different contributions were done
- K-factors were obtained
- Numbers (tables) and plots can be found in this link:
<http://cern.ch/montoya/xsections/>